

## REMARKS

Claims 1-13 are pending and under consideration in the above-identified application.

In the Office Action, Claims 1-13 were rejected.

In this Amendment, Claims 1, 4 – 9 and 13 are amended. No new matter has been introduced as a result of this Amendment.

Accordingly, Claims 1, 4 – 9 and 13 remain at issue.

### **I. 35 U.S.C. § 102 Anticipation Rejection of Claims 1, 3, 5, 9, 11, and 13**

Claims 1, 3, 5, 9, 11, and 13 were rejected under 35 U.S.C. § 102(b) as being anticipated by *Nguyen* (U.S. Patent No. 6,566,786 B2). Although Applicant respectfully traverses this rejection, Claim 1 has been amended to clarify the invention and remove any ambiguities that may have been at the basis of this rejection.

Claim 1 is directed to a MEMS resonator. The MEMS comprises a substrate, an electrode formed on said substrate, and a beam formed on the substrate *with said electrode therebetween*, and at least one support column is provided between said substrate and said beam.

Referring to Applicants' Figure 1 as an illustrative example, Applicants' claimed invention comprises FIG. 1 shows an embodiment of a MEMS resonator. A MEMS resonator 27 includes electrodes 14 and 15 disposed on a substrate 12, a beam disposed to face the electrodes 14 and 15 separated by a space 16, and a support column 24 provided between the substrate 12 and the beam 17.

This is clearly unlike *Nguyen*. In fact, *Nguyen* discloses (emphasis added):

“FIG. 5a shows a perspective view schematic of a practical two-resonator micromechanical filter capable of operation in the HF to VHF range. As shown, the filter consists of two  $\mu$ -mechanical clamped-clamped beam resonators *with anchors 18 at their opposite ends, coupled mechanically by a soft coupling spring or beam 19, all suspended above a substrate (not shown). Conductive (polysilicon) strips 20, 22, 24, and 26 underlie each resonator by approximately 1000 Å (as also in FIGS. 6, 9 and 17a), a center one 20 serving as a capacitive transducer input electrode positioned to induce resonator vibration in a direction perpendicular to the substrate, a center one 24 serving as an output electrode and the flanking ones 22 and 26 serving as tuning or frequency pulling electrodes capable of voltage-controlled tuning of resonator frequencies.*”

See Column 9, lines 6 – 19, and Fig. 5A. That is, *Nguyen* teaches that the electrodes 20, 22, 24, and 26 are coupled mechanically by a beam 19, all suspended above a substrate at different horizontal positions over the substrate, but fails to teach that the beam 19 is formed over the electrodes 20, 22, 24, and 26 and a support column is provided between the substrate and said beam 19, as required by Claim 1.

For at least this reason, *Nguyen* fails to teach or suggest all of the limitations of Claim 1. Thus, Claim 1 is patentable over *Nguyen*, as are dependent Claims 3 and 5, for at least the same reasons.

Independent Claim 9, which recites the same distinguishable limitation as that of Claim 1, is also patentable over *Nguyen*, as are dependent Claims 11 and 13, for at least the same reasons.

Accordingly, Applicants respectfully request that this claim rejection be withdrawn.

## **II. 35 U.S.C. § 102 Anticipation Rejection of Claims 6-8**

Claims 6-8 were rejected under 35 U.S.C. § 102(e) as being anticipated by *Ma* (U.S. Patent No. 6,808,954 B2). Although Applicant respectfully traverses this rejection, Claims 6-8 have been amended to clarify the invention and remove any ambiguities that may have been at the basis of this rejection.

Claim 6 is directed to a method of manufacturing a micro electro- mechanical system (MEMS) resonator. The method comprises forming an electrode on a substrate, forming a layer on the substrate including the electrode, selectively forming an opening that reaches the substrate at a portion of the layer where a support column can be formed, forming a beam on the layer, forming inside the opening the support column integrated with the beam and the substrate, and removing the layer.

That is, as illustrated in FIG. 4, the column 24 is integrated with the beam 17 and with the substrate 12.

In contrast, in *Ma* the beam 174 is in contact with the beam base 130 rather than with the substrate 100 and 110. As such, *Ma* fails to teach all of the limitations of Claim 6.

Claim 7 is directed to a method of manufacturing a MEMS resonator. The method comprises forming an electrode and a support column on a substrate, forming a layer on the substrate including the electrode and the support column, forming an opening at a portion of the layer that reaches the electrode, forming a beam on the layer and the electrode, and removing the layer such that the beam hangs over the support column providing a space therebetween and contacts the electrode.

That is, as illustrated in FIG. 6, the beam 17 is vertically distant from the support column 24 and contacts the electrode 18

In contrast, *Ma* fails to teach or suggest a support column formed on the substrate 100, 110 that does not contact the beam 174, as required by Claim 7.

Claim 8 is directed to a method of manufacturing a MEMS resonator. The method comprises forming a electrode on a substrate, forming a layer on the substrate including the electrode, selectively forming a first opening having a depth not to reach the substrate at a portion of the layer where a support column can be formed and a second opening at another portion of the layer that reaches the electrode, forming a beam on the layer and the electrode and forming inside the opening the support column integrated with the beam, and removing the layer.

That is, as illustrated in FIG. 5, the support column 24 is integral with and projects from the beam 17 towards the substrate 100, 110 but does not contact it.

In contrast, *Ma* fails to teach or suggest the structure of the claimed support column, as required by Claim 8.

Accordingly, Claims 6 – 8 are all patentable over *Ma*.

### **III. 35 U.S.C. § 103 Obviousness Rejection of Claims**

Claims 2, 4, 10 and 12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Nguyen* in view of *Nguyen* (“*Nguyen B1*”) (U.S. Patent No. 6,249,073 B1). Applicant respectfully traverses this rejection.

Claims 2, 4, 10 and 12 are dependent on corresponding independent Claims 1 and 9, shown above to be patentable over *Nguyen*. Moreover, in addition to *Nguyen*, *Nguyen B* also fails to fairly teach or suggest that a beam is formed on the substrate with said electrode therebetween, and at least one support column is provided between said substrate and said beam.

Thus, no combination of the cited references fairly teaches or suggests the subject matter of Claims 1 and 9. Accordingly, Claims 1 and 9 are patentable over the cited references, taken singly or in any combination with each other, as are corresponding dependent Claims 2, 4, 10 and 12, for at least the same reasons.

Accordingly, Applicants respectfully request that these claim rejections be withdrawn.

#### IV. Conclusion

In view of the above amendments and remarks, Applicant submits that Claims 1, 4 – 9 and 13 are clearly allowable over the cited prior art, and respectfully requests early and favorable notification to that effect.

Respectfully submitted,

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